are testing new programs with names like JAZZ, Arachne, and Euler. U.S. Human Genome Project leader Francis Collins predicts that by "late summer" everyone will have access to such souped-up computer tools. If so, by September, genome assembly could be a whole new ball game.

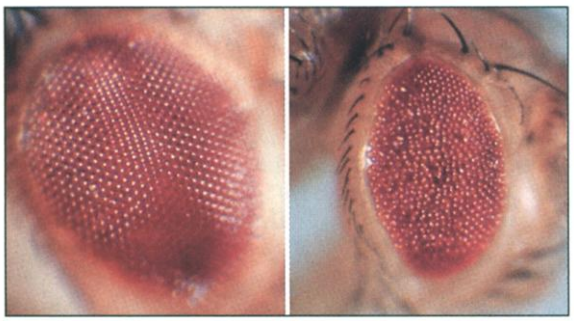
–ELIOT MARSHALL

NEURODEGENERATIVE DISEASE

Using the Fruit Fly to Model Tau Malfunction

In the slow-motion train wreck that is Alzheimer's disease, different types of debris pile up inside and outside dying brain neurons. But despite decades of research, researchers still don't know exactly what kills the cells.

Most attention has focused on defects in a protein called β amyloid, which clumps up into plaques outside neurons and seems to throw the switch that first steers the cells off course. But inside neurons, another protein called tau may act as an accomplice. In Alzheimer's brains, tau forms part of abnormal intracellular structures called tangles, although it's not clear whether tangle formation is the cause or result of the neuronal degeneration. It is clear, however, that other human dementias can be caused by tau defects even in the absence of plaques, indicating that here at least the tau defect is primary. Now a new fruit fly model may help reveal just how defective tau sends healthy brain cells veering off track.



Rough and ready. Because fruit flies expressing mutant tau have smaller, rougher eyes (right) than is normal (left), they should help researchers identify new dementia-related genes.

CREDIT: MEL FEANY/HARVARD MEDICAL SCHOOL

In work published online by *Science* on 14 June (www.sciencexpress.org), Mel Feany of Harvard Medical School in Boston and her colleagues show that fruit flies producing human tau undergo brain neuron degeneration, although, in a surprising finding, the dying fly neurons do not contain tangles. It's "very elegant, nicely done work," says Zaven Khachaturian, senior scientific adviser to the Alzheimer's Association. "It could change the focus of research for developing treatments [for dementias]."

No mutations in the *tau* gene have been linked to Alzheimer's, but in 1998, researchers discovered that *tau* mutations do cause a group of dementias with the unwieldy name hereditary frontotemporal dementia and parkinsonism linked to chromosome 17 (FTDP-17). To find out how tau damages neurons, Feany's team introduced either the normal human *tau* gene or a mutant version that causes FTDP-17 into fruit flies. Flies with either gene died younger than controls, but the effect was most pronounced in those with the mutant gene, the researchers report. The results suggest that the normal and mutant tau had each taken its toll.

The researchers then watched what happened to the nervous systems of both types of transgenic flies as they aged. Brain cells in day-old flies were fine, but neurons in doddering 30-day-old flies had disintegrating cell nuclei and other organelles. "We saw them falling apart," Feany says. The human tau proteins especially damaged neurons that communicate using the neurotransmitter acetylcholine—a group of cells that are also hit heavily in Alzheimer's disease.

Together, the results suggest that the fruit flies with human tau mimic the tau-induced damage seen in Alzheimer's disease, FTDP-17, and other dementias in which tau goes awry, Feany says. But the absence of tangles in the transgenic flies was puzzling. Because the brains of FTDP-17 patients contain copious tangles, some researchers speculate that the cells are killed by tangles that gum up their internal works, although others suggest that soluble forms of defective tau proteins can kill without forming tangles. The flies with the mutant tau protein support the latter view, Feany says: Even though no tangles formed in their neurons, the cells died anyway.

Some experts caution, however, that the lack of tangles might mean that flies aren't a good model of human dementias. "The worry is that cells are dying by a different mechanism than neurons do when they make tangles in Alzheimer's disease," says neuroscientist John Hardy of the Mayo Clinic in Jacksonville, Florida.

Others don't see a problem. "I'm not bothered one bit that [they] didn't find tangles," says neuropathologist John Trojanowski of the University of Pennsylvania School of Medicine in Philadelphia, one of the researchers who linked *tau* mutations to FTDP-17. Because the protein normally stabilizes microtubules, which help ferry life-sustaining molecules to nerve endings, he suggests that defective but soluble tau might kill neurons by crippling their transport system. Others say

ScienceScope

Cracking the Code A team of cryptographers is suing the Recording Industry Association of America (RIAA) over the right to present a paper at a conference. In a federal court suit filed last week, Princeton University computer scientist Ed Felten and colleagues claim that a provision of the 1998 Digital Millennium Copyright Act (DMCA) unconstitutionally limits researchers from sharing information.

Last year, Felten's team claimed to have cracked a digital "watermarking" scheme for music. But earlier this year the researchers dropped plans to describe their feat at a conference after feeling threatened by the RIAA, which could have sued under the DMCA (*Science*, 4 May, p. 826). The suit seeks to clarify their right to present the work in public.

The lawsuit is "inexplicable," says RIAA general counsel Cary Sherman, because the group doesn't intend to sue the team. But Gino Scarselli, a lawyer for the cryptographers, says that the court needs to "look at the long-term effects of the [DMCA]. ... At its very core, it is a constraint on publication."

Partnership Perils A new report outlining best practices for university-industry partnerships is ruffling some feathers. The Business–Higher Education Forum last week released "Working Together, Creating Knowledge: The University-Industry Research Collaboration Initiative," which uses case studies to highlight the promise and peril of linking scholars and corporate dollars.

The report—produced by a panel led by Pfizer CEO Hank McKinnell and Nils Hasselmo, president of the Association of American Universities—highlights what McKinnell calls "the best of times and the worst of times." In particular, he says that Monsanto's collaboration with Washington University in St. Louis is a good model, whereas Novartis's arrangement with the University of California, Berkeley, raises some red flags.

McKinnell's comments weren't welcome at Berkeley. "It is understandable why the CEO of a large pharmaceutical company would strongly prefer the Washington University–Monsanto agreement," says Berkeley economist Gordon Rausser. "Under this agreement, Monsanto controls the research agenda. ... Such terms would not be acceptable [at Berkeley]." The Berkeley deal, he noted, conforms to the report's recommendations.

Contributors: Eliot Marshall, Robert Koenig, Charles Seife, David Malakoff

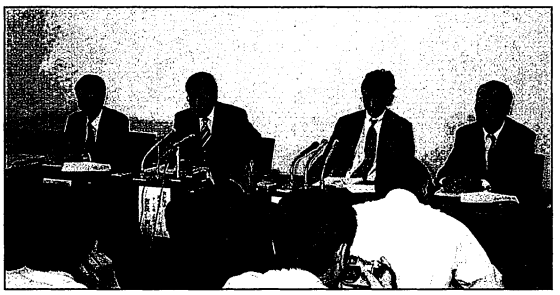
defective tau could alter signaling cascades leading to oxidative damage or apoptosis.

If the neural decay seen in the altered fruit flies does turn out to resemble that in human dementias, the fly model should help researchers work out just how tau causes neuronal death. Because flies carrying the mutant human *tau* gene have visibly altered eyes, it will now be easy to create and screen thousands of mutant flies to help uncover those genes whose protein products either boost or block tau's effects. That, in turn, could offer novel targets for drugs that keep neurons from derailing, which could lead to new treatments for human dementias. **–DAN FERBER**

ESPIONAGE CASE

Japan Says Cell Lines Weren't Used at RIKEN

TOKYO—The strange case of the Japanese researcher accused of taking biological materials he developed at the Cleveland Clinic Foundation in Ohio to his new job at Japan's Institute of Physical and Chemical Research (RIKEN) took another odd twist last week. RIKEN officials reported that investigators can find no evidence that the materials were ever used in experiments at its Brain Science Institute, although some of the materials may have been temporarily stored in neuroscientist Takashi Okamoto's RIKEN lab.



Memory loss. RIKEN's Akira Kira, second from left, and other officials report on allegedly stolen Alzheimer's research materials.

RIKEN launched the investigation after U.S. officials claimed that Okamoto had stolen cell lines and DNA samples from the Cleveland Clinic (*Science*, 18 May, p. 1274). In early May, a U.S. grand jury indicted Okamoto—who worked on Alzheimer's disease at the Cleveland Clinic from 1997 to 1999—and Hiroaki Serizawa, a researcher at the University of Kansas Medical Center in Kansas City, on charges of conspiring to steal trade secrets for the benefit of a foreign government. RIKEN is technically a nonprofit corporation but is funded by Japan's government. The charges surprised many researchers, who say that scientists often take materials they have developed with them to their new jobs.

A six-member team of scientists drawn from RIKEN and outside institutes traced the sources of all 194 samples of DNA, cell lines, and reagents that Okamoto's team had used in his RIKEN lab. The team also asked other RIKEN research groups if they had acquired any material from Okamoto. "We have never used any material [from the Cleveland Clinic] in experiments at RIKEN," concluded Akira Kira, a RIKEN vice president who led the investigation.

But the investigation turned up a new wrinkle. While he was still in Ohio, Okamoto allegedly shipped some biological material from the Cleveland Clinic to a researcher working at another institute in Japan. That researcher later joined Okamoto's team at RIKEN and brought the material with him. But the researcher told RIKEN investigators that the samples later disappeared from a laboratory refrigerator. The investigators believe that Okamoto e-mailed another RIKEN scientist asking about the possibility of sending materials from Ohio to RIKEN for storage.

Okamoto has been on leave and incommunicado since the indictment. Serizawa has asked for a delay in his trial, scheduled to begin next month. **–DENNIS NORMILE**

ASTRONOMY

Infrared Gleam Stamps Brown Dwarfs as Stars

PASADENA, CALIFORNIA—Once upon a time, a star was a star and a planet was a planet and never the twain would meet. But times have changed. Try making a statement like that today, and even polite astronomers will roll their eyes at your naivete and sigh nostalgically.

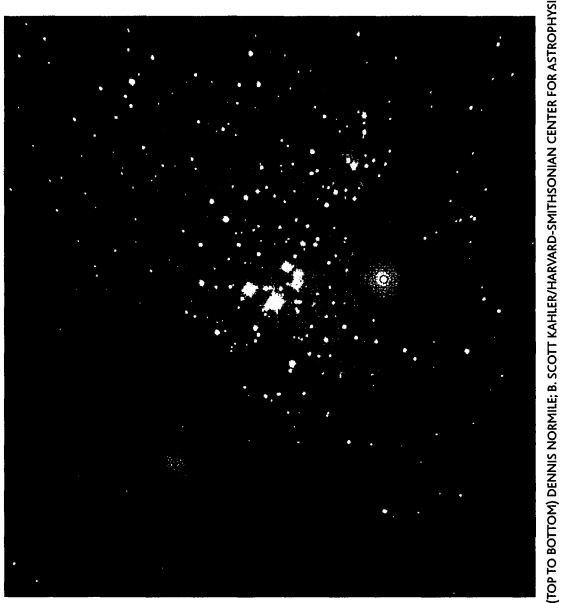
Their concern is with a misfit class of gaseous balls recently discovered orbiting nearby stars or floating freely through space. It's hard to know how they formed: They seem too heavy to have developed from the slow agglomeration of material, like jumbo-sized planets such as Jupiter. Yet they are too light to ignite the nuclear fusion that powers stars. Confused astronomers named the objects failed stars, superplanets, or the noncommittal brown dwarfs.

But now, the surprisingly bright infrared light from 63 brown dwarfs in the nearby Trapezium star cluster is helping make the case that the free-floating brown dwarfs are failed stars and not stray planets, astronomers told the American Astronomical Society here on 7 June.*

Traditionally, stars and planets are easy to distinguish. Stars weigh more than seven times as much as Jupiter—the threshold mass for nuclear fusion—and form out of a collapsing cloud of cold molecular gas. Any leftover gas then swirls into a protoplanetary disk around the newborn star. Planets, on the other hand, weigh less than seven Jupiter masses and, according to the most popular theory, form by scavenging rock and gas from the disk.

Several discoveries in the past 5 years have called this simple picture into question. Moving up from the planetary end of the mass range, several teams have identified 67 planets orbiting nearby stars. These exoplanets weigh up to 17 times the mass of Jupiter. And dropping down from stellar masses, astronomers have discovered almost 200 objects floating freely like stars in the Milky Way that weigh as little as 10 Jupiter masses (*Science*, 6 October 2000, p. 26). So which are the stars and which are the planets?

At least part of the question has now been answered: The free-floating brown dwarfs form like stars. Although brown dwarfs have no nuclear fire in their belly, they are hot enough to emit infrared radiation, just like a human body. And if they formed from contracted clouds like a star, a warm, dusty disk should orbit the dwarf and radiate additional infrared light. It was precisely this extra light that astrophysicist Charles Lada of the Harvard-Smithsonian Center for Astrophysics in Cambridge, Massachusetts, was looking for when his team surveyed 100 brown dwarfs in the nearby Trapezium cluster, a stellar nursery in the constellation Orion. The search, conducted in March 2000 with the 3.5-meter New Technology Telescope in Chile, was a success: 63 dwarfs showed evidence of disks. An oversized free-



Worlds apart. Evidence of protoplanetary disks shows that lone brown dwarfs form like stars, not planets.

CREDITS: (TOP TO BOTTOM) DENNIS NORMILE; B. SCOTT KAHLER/HARVARD-SMITHSONIAN CENTER FOR ASTROPHYSICS

* 198th meeting, 3 to 7 June.